

Date: Tuesday, 09/09/2008 1:24:36 PM  
 User: Julie Lecocq

## Process Sheet

Customer	: CU-DAR001 Dart Helicopters Services	Drawing Name	: 412 X-TUBE INST, LOW NARROW AFT
Job Number	: 41921	Part Number	: D412664205
Estimate Number	: 12817	Drawing Number	: D412-664 -245 REV C
P.O. Number	:	Project Number	: N/A
This Issue	: 09/09/2008 S.O. No. :	Drawing Revision	: C
Prsht Rev.	: NC	Material	:
First Issue	: Type : CROSSTUBES	Due Date	: 22/09/2008 Qty: 1 Um: Each
Previous Run	: 41920		
Written By			
Checked & Approved By	<u>JUD 08.9.09</u>		
Comment	: Est Rev:A New Issue 07-04-05 JLM Est Rev:B 08-06-12 add comment in seq. 24 DD verified by:EC		

## Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description :
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1.0	DC	DOCUMENT CONTROL
-----	----	------------------



Comment: DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D412-664-205 CHG001

*A for JUD 08.9.16*

2.0	PACKAGING 1	PACKAGING RESOURCE #1
-----	-------------	-----------------------



Comment: PACKAGING RESOURCE #1



3.0	D412664205TRN	Crosstube Turning Detail
-----	---------------	--------------------------



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

CROSSTUBE TURNING DETAIL  
batch B40547*DP 8-10-15*

4.0	BENDING	BENDING MACHINE - SKIDTUBES
-----	---------	-----------------------------



Comment: BENDING MACHINE

Bend tube as per Dwg D412-664-243 using CNC bender program 412-af and Folio FT010

*DP 8-10-16*

5.0	QC6	DIMENSIONAL CHECK
-----	-----	-------------------



Comment: DIMENSIONAL CHECK

*DP 08.10.20*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D412-664-205 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes ☒ No ☐ DQA: LA Date: 08-11-18

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR: <u>41921</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
08.10.20	4	Tube is narrow after bending	CP 08.10.20 PL QSI 002	Acceptable	CP 08-10-22	CP 08.10.20 PL QSI 042	CP 08.10.20 PL QSI 042	CP 08.10.22

NOTE: Date & initial all entries

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Drawing Name: 412 X-TUBE INST,LOW NARROW AFT

Job Number: 41921

Part Number: D412664205

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

D36061

Cuff



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

CUFF

Batch: 31635

RT 08-10-20

7.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Drill Rivet holes as per Dwg D412-664-245 using DT8972.

2-Drill pilot holes in tube as per Dwg D412-664-245

3-Ream hole to finish size in tube as per Dwg D412-664-245

4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-245

AWM 8-10-22

8.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



AWM 8-10-22



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat Tube & Cuffs as per QSI 005 4.1

9.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

8-10-22 @

10.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

8-10-22 @

11.0

OUTSIDE SERV.10

OUTSIDE SERVICES -skids



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038Or

Issue P/O: 7442 LPI as per ASTM 1417

Level 2 Attach copy of NDT results to work order

CD 8/10/24 @

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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Drawing Name: 412 X-TUBE INST, LOW NARROW AFT

Job Number: 41921

Part Number: D412664205

Job Number:



Seq. #:

Machine Or Operation:

Description :

12.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage

Ensure copy of NDT results attached to work order.

*8/10/23 (1)*

13.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: Inspect for damage & ensure results are as per Dwg D412-664-203

*08/10/24 (40)*

14.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Rivet Cuffs as per Dwg D412-6647-245. with Sika flex in Between tube & Cuff

A/R SIKAFLEX -241/-291

BATCH:

*M109449*

*Q.m 08.11.10 (1)*

15.0

CR3212407

CHERRY RIVET



Comment: Qty.: 44.0000 Each(s)/Unit Total: 44.0000 Each(s)

CHERRY RIVET

Batch:

*M109840*

*Q.m 08.11.10 (55)*

16.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

*ST 08-11-11*

17.0

QC14

INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Wrap in plastic bag to protect from scratches

*m 08.11.12 (1)*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

Date: Tuesday, 09/09/2008 1:24:36 PM  
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Job Number: 41921

Part Number: D412664205

Job Number:



Seq. #:	Machine Or Operation:	Description :
---------	-----------------------	---------------

18.0	D31891	Chafing Shield
------	--------	----------------



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)  
Chafing Shield  
Batch: 39736

RT 08-11-13

19.0	D3595063570	RUBBER CUSHION
------	-------------	----------------



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)  
Rubber Cushion  
Batch: 37971

RT 08-11-13

20.0	D28961	Support
------	--------	---------



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)  
Pick:  
Qty Part number Description Batch  
1 D2896-1 Support 35577

RT 08-11-13

21.0	D2856600	Abrasion Strip
------	----------	----------------



Comment: Qty.: 0.9450 f(s)/Unit Total : 0.9450 f(s)  
Abrasion Strip  
2 X D2856-600-1009  
Batch: 36398

RT 08-11-13

22.0	MS2192028	Clamp(per MIL-DTL-8783C)
------	-----------	--------------------------



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)  
Pick:  
Qty Part number Description Batch  
4 MS21920-28 Clamp 108847<sup>x3</sup>/10918<sup>x1</sup>

RT 08-11-13

23.0	MS2192030	clamp(per MIL-DTL-8783C)
------	-----------	--------------------------



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)  
clamp(per MIL-DTL-8783C)  
batch: 106840 109545

RT 08-11-13

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



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Job Number: 41921

Part Number: D412664205

Job Number:



Seq. #:

Machine Or Operation:

Description :

24.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

Assemble as per Dwg D412-664-245

1- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe

2-Install Chaffing Shields

3-Instal support with magnibond 6398 per dwg D412-664-245, using installaiton jig DT9024 with 0.010 thick brass shims on both chafing sheild (D3189-1).  
cure for 12hrs before packaging.

Time & date of application: 08-11-13 1140

Batch: 108966

85  
08-11-13

25.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

SS 08/11/14

26.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Pick Packing Kit

27.0

AN640A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Bolt

Batch:

M168940

SS 08/11/14

28.0

AN641A

Bolt



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Bolt

Batch:

M167013

SS 08/11/14

Date: Tuesday, 09/09/2008 1:24:36 PM  
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## Process Sheet

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Drawing Name: 412 X-TUBE INST,LOW NARROW AFT

Job Number: 41921

Part Number: D412664205

Job Number:



Seq. #:

Machine Or Operation:

Description :

29.0

MS21042L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total : 6.0000 Each(s)

Nut

Batch:

M108183

SS 08/11/14 (X)

30.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total : 18.0000 Each(s)

Washer

Batch:

M109371

SS 08/11/14 (X)

31.0

QC4

INSPECT 100% KITS FOR COMPLETENESS



Comment: INSPECT 100% KITS FOR COMPLETENESS

SS 08/11/14 (X)

32.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Identify and pack for shipping as per PPP D412-664-105

Ren A

8/11/14

SP  
(A)

33.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

08/11/14 (X)

Job Completion

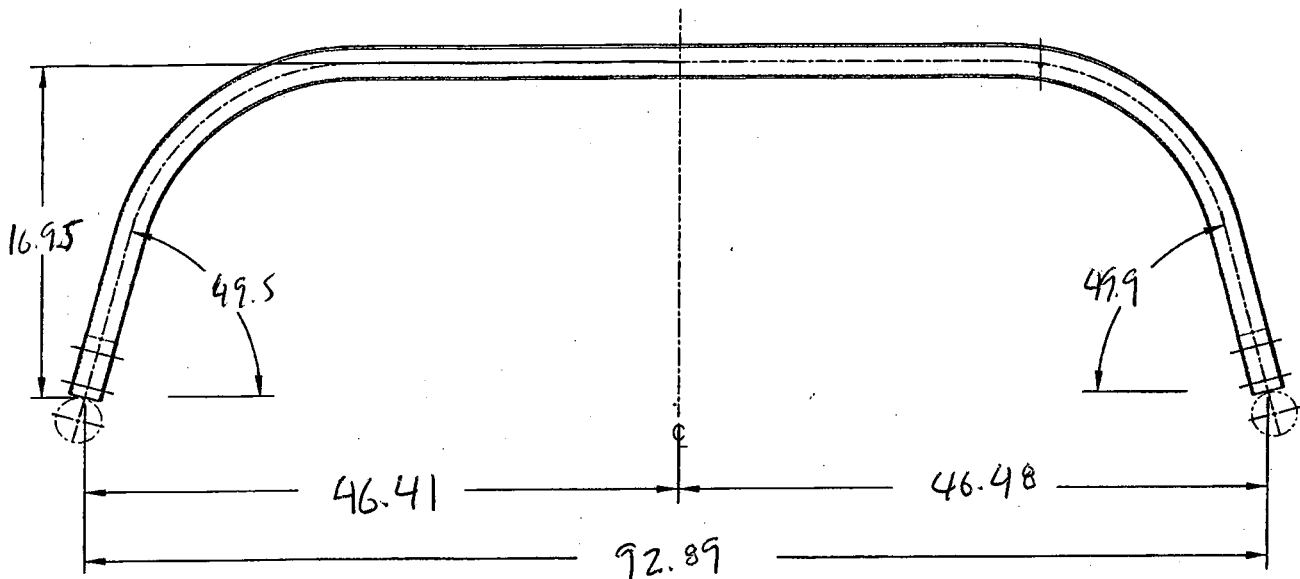


mf 08-11-14

D412 664 205 B 41921

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 41921	
<b>Description:</b> Crosstube Low Narrow Aft (412)		<b>Part Number:</b> D412-664-205	
<b>Inspection Dwg:</b> D412-664-245 <b>Rev:</b> C		<b>Page 1 of 1</b>	

Required Dimension	Min	Max
Height	16.69	16.95
1/2 Span	46.47	46.73
Angle	49°	52°
Total Span	92.94	93.46



Comments
ACCEPTABLE <i>UP</i> 08.10.20

QC15 Inspection	<i>UP</i>
Date	08.10.20

Rev	Date	Change	Revised by	Approved
A	07.04.27	New Issue	KJ/JM	<i>[Signature]</i>

**DART**

DESIGN <b>QP</b>	DRAWN BY <b>QP</b>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <b>[Signature]</b>	APPROVED <b>[Signature]</b>	DRAWING NO. D412-664-245	REV. C SHEET 1 OF 3
DATE 07.03.29		TITLE CROSSTUBE ASS'Y (412 LOW-N AFT) NTS	
A	06.12.01	NEW ISSUE	
B	07.03.01	CHG CUFF AREA, CHG RUBBER CUSHION	
C	07.03.29	CHG RIVET AND RUBBER CUSHION	

**RELEASED**07.04.24 **[Signature]****PARTS LIST:**

Qty	Part Number	Description
X	D412-664-245	CROSSTUBE ASSEMBLY (412 LOW-NARROW AFT)
1	D6009-129	CROSSTUBE
2	D2856-600-1009	ABRASION STRIP
1	D2896-1	SUPPORT
2	D3189-1	CHAFING SHIELD
2	D3595-063-570	RUBBER CUSHION
2	D3606-1	CUFF
44	CR3212-4-07	RIVET (OR M7885/3-4-07)
4	MS21920-28	CLAMP
2	MS21920-30	CLAMP (OR MS21920-32)
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
A/R	SIKAFLEX-241/-291	SEALANT (OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT)

**GENERAL NOTES:**

- 1) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 2) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 123.59±0.020 (BEFORE BENDING/TRIMMING)
- 3) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART 005 4.2
- 4) PART IS SYMMETRIC ABOUT CENTERLINE.
- 5) RUN-OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 6) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D., EXCEPT UP TO 10% IS ALLOWED IN AREA NOTED.
- 7) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 8) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 9) INSTALL D2856-600-1009 ABRASION STRIP WITH A 0.13 (REF) GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 10) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 11) APPLY A 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 12) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE CROSSTUBE SUPPORT.
- 13) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 14) INSTALL D3606-1 CUFF AFTER CHEMICAL CONVERSION COAT BUT BEFORE PAINT, WITH A LAYER OF SIKAFLEX-241/-291 OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT BETWEEN CUFF AND CROSSTUBE. SEAL EDGE OF CUFF TO ENSURE NO GAPS.
- 15) TOUCH-UP HOLES WITH CHEMICAL CONVERSION COAT.

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WITHOUT NOTICE

WORK ORDER

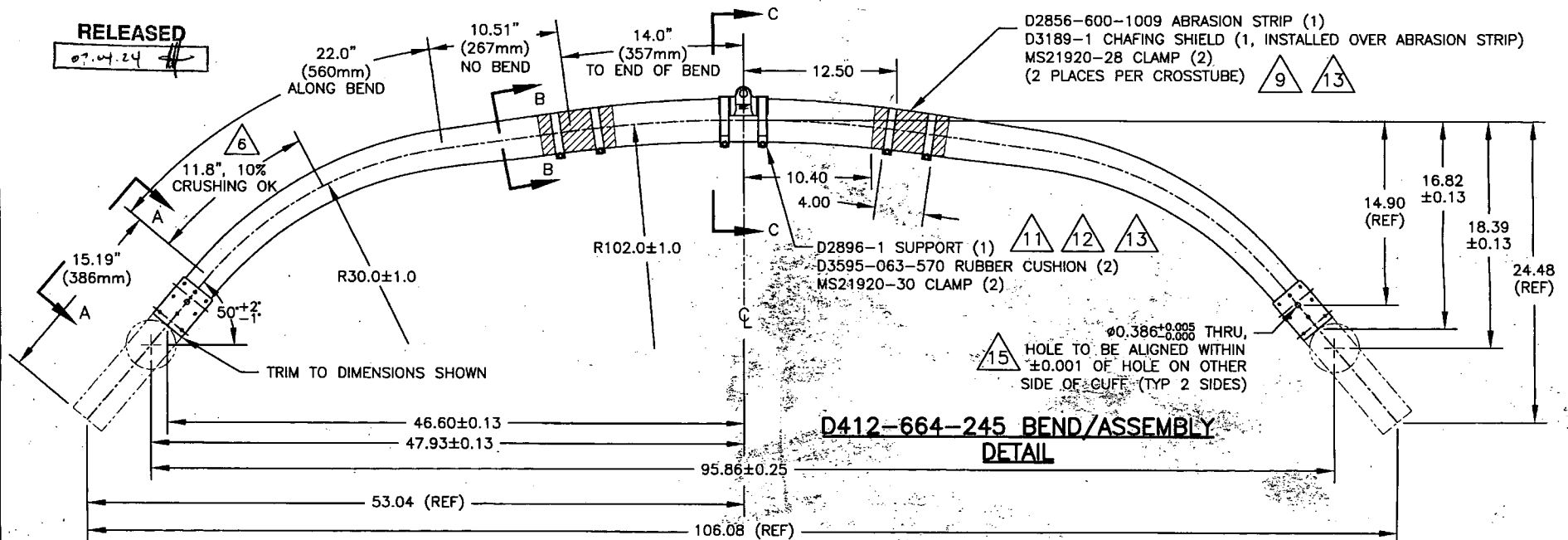
NO. 41921

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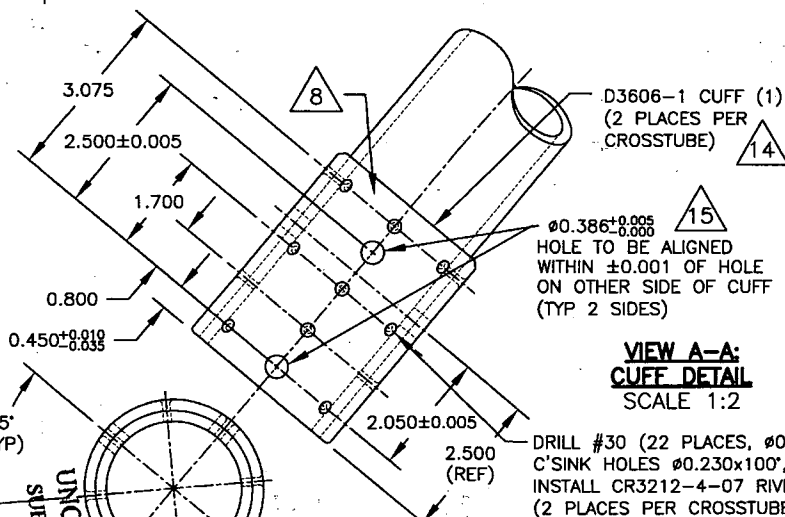
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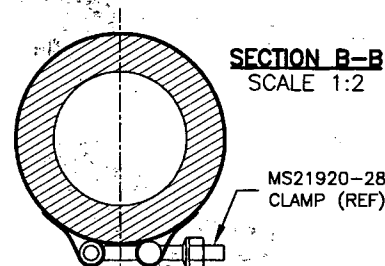
07.04.24



**D412-664-245 BEND/ASSEMBLY  
DETAIL**



**VIEW A-A:  
CUFF DETAIL  
SCALE 1:2**



**SECTION B-B  
SCALE 1:2**

APPLY MAGNOBOND  
BETWEEN D2896-1 AND  
THE CROSSTUBE



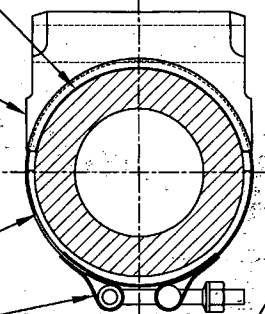
D2896-1  
SUPPORT  
(REF)

D3595-063-570  
RUBBER CUSHION  
(UNDER CLAMP, REF)

MS21920-30  
CLAMP (REF)



**SECTION C-C  
SCALE 1:2**



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DESIGN	DRAWN BY	<b>DART</b>	DART AEROSPACE LTD. HARRISBURG, ONTARIO, CANADA
CHECKED	APPROVED	DRAWING NO. D412-664-245	REV. C SHEET 2 OF 3
DATE	TITLE	SCALE	
07.03.29	CROSSTUBE (412 LOW-NARROW AFT)	1:8	

NO. 11/22  
STOP COPY  
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WITHOUT NOTICE  
WORK ORDER







# LIQUID PENETRANT TEST REPORT

P- 09129

PAGE 1 OF 1

CLIENT

Dart Aerospace  
Chantal

DATE

2008-10-23

TIME

AM

PM

ATTENTION

1270 Aberdeen St.

ACUREN JOB NO.

188-08-1581

ADDRESS

Hawkesbury, Ont

PO/VO NO.

WORK LOCATION

Hawkesbury

ACCEPTANCE STD.

ASTM M17/931-038

REV./DATE

2005

PROJECT

206 LFWO X-TUBE, 412 X-TUBE INST, LOW MARGOW APT

ITEM(S) EXAMINED

Job #'s 42585, 42586, 41920, 41921

JOB DESCRIPTION

PROCEDURE NO. LT-0002 Rev./DATE

TECHNIQUE NO. LT-0002 Rev./DATE

PART NO.

D206667103BL, D412664205

MATERIAL

ALODINE ALUM.

THICKNESS

N/A

SCOPE

WET FLOUORESCENT LIQUID PENETRANT INSPECTION CARRIED OUT ON 100%  
EXTERNAL SURFACE

TEST DETAILS

ETHOD

☒ FLUORESCENT

☐ VISIBLE

☒ WATER WASH

☐ SOLVENT REMOVABLE

☐ POST EMULSIFIED

AMILY BRAND

Magnaflux

BLACK LIGHT S/N

B171

☐ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup>

☐ AMBIENT < 2 fc

ENETRANT

MINIMUM DWELL TIME

30

MIN.

LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE

ENETRANT REMOVER

H<sub>2</sub>O

MINIMUM DRY TIME

> 10

MIN.

OTHER CAL FEB 12 09

EVELOPER

SK052

MINIMUM DWELL TIME

10

MIN.

LIGHT METER S/N

CAL DUE DATE

EVELOPER TYPE

☒ NON AQUEOUS

☐ AQUEOUS

☐ DRY

TEST SURFACE

SURFACE CONDITION

☐ AS GROUND

☐ AS WELDED

☐ MACHINED

☐ SHOT BLASTED

☒ CLEAN BARE METAL

SURFACE TEMPERATURE

☐ < - 4°C/ 20°F

☐ - 4°C/ 20°F TO 10°C/50°F

☒ 10°C/50°F TO 52°C/125°F

☐ > 52°C/125°F

RESULTS-

☐ METRIC ☐ IMPERIAL

ITEM

COMMENTS

ACCEPT

REJECT

12585: ACCEPTABLE

12586: ACCEPTABLE

11920: ACCEPTABLE

11921: ACCEPTABLE

Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE

Chantal Lavoie

Chantal Lavoie

SIGNATURE

DTR #

TECHNICIAN (SIGNATURE):

Frederick Chagnon

1<sup>ST</sup> TECHNICIAN

2<sup>ND</sup> TECHNICIAN

REPORT

REVIEWED BY:

NAME

INITIALS

NAME (PRINT):

CGSB LEVEL

II

SNT LEVEL

II

CGSB LEVEL

SNT LEVEL

CGSB REG. NO

10560

CGSB REG. NO

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PT Sept 2005